10-5-1963

Test 853: John Deere 4020 LPG

NEBRASKA TRACTOR TEST 853 - JOHN DEERE 4020 LPG

The University of Nebraska Agricultural Experiment Station
E. F. Frolik, Dean; H. H. Kramer, Director, Lincoln, Nebraska

POWER TAKE-OFF PERFORMANCE

Hp	Crank-shaft speed rpm	Fuel Consumption Gal per hr	Fuel Consumption Lb per hp-hr	Hp-hr per gal	Temperature Degrees F Cooling medium	Air wet bulb	Air dry bulb	Barometer inches of Mercury
MAXIMUM POWER AND FUEL CONSUMPTION								
Rated Engine Speed—Two Hours								
90.48	2200	10.107	0.475	8.95	179	64	75	29.030
Standard Power Take-off Speed (1000 rpm)—One Hour								
81.14	1895	8.798	0.461	9.22	180	65	75	29.033
VARYING POWER AND FUEL CONSUMPTION—TWO HOURS								
80.71	2309	9.191	0.484	8.78	172	66	74	.....
0.00	2519	3.466	.....	.....	156	65	72	.....
42.25	2416	6.607	0.665	6.39	162	65	72	.....
90.44	2201	10.221	0.480	8.85	178	65	74	.....
21.64	2474	5.287	1.038	4.09	159	64	72	.....
61.79	2357	7.828	0.538	7.89	163	64	72	.....
Av 49.47	**2379**	**7.100**	**0.610**	**6.97**	**165**	**65**	**73**	**29.028**

DRAWBAR PERFORMANCE

Hp	Draw-bar pull lbs	Speed miles per hr	Crank-shaft speed rpm	Slip of drivers %	Fuel Consumption Gal per hr	Fuel Consumption Lb per hp-hr	Fuel Consumption Hp-hr per gal	Temp Degrees F Cool-ing med	Temp Degrees F Air wet bulb	Temp Degrees F Air dry bulb	Barometer inches of Mercury
VARYING DRAWBAR POWER AND FUEL CONSUMPTION WITH BALLAST											
Maximum Available Power—Two Hours—4th Gear											
75.19	5716	4.93	2199	5.67	9.676	0.547	7.77	197	64	78	28.820
75% of Pull at Maximum Power—Ten Hours—4th Gear											
63.84	4548	5.26	2307	3.94	8.600	0.573	7.42	173	60	66	29.042
50% of Pull at Maximum Power—Two Hours—4th Gear											
44.37	3053	5.45	2357	2.64	6.853	0.656	6.47	189	67	87	28.810
MAXIMUM POWER WITH BALLAST											
62.63	10217	2.30	2282	14.75	2nd Gear			169	53	55	28.820
77.98	7899	3.70	2201	8.28	3rd Gear			170	55	61	28.830
79.12	6055	4.90	2196	6.02	4th Gear			178	58	67	28.820
75.36	4389	6.44	2199	4.38	5th Gear			176	60	71	28.830
74.61	3324	8.42	2197	3.05	6th Gear			169	60	71	28.830
75.91	2530	11.25	2198	2.22	7th Gear			172	60	71	28.830
MAXIMUM POWER WITHOUT BALLAST											
73.74	5925	4.67	2197	11.44	4th Gear			183	63	72	29.020

VARYING DRAWBAR PULL AND TRAVEL SPEED WITH BALLAST—4th Gear

Pounds pull	6055	6206	6238	6353	6295	6251
Horsepower	79.12	72.72	65.40	58.24	49.20	40.59
Crankshaft speed rpm	2196	1971	1767	1546	1318	1095
Miles per hour	4.90	4.39	3.93	3.44	2.92	2.44
Slip of drviers %	6.02	6.16	6.30	6.44	6.44	6.30

TIRES, BALLAST and WEIGHT		**With Ballast**	**Without Ballast**
Rear tires	—No, size, ply & psi	Two 18.4-34; 8; 18	Two 18.4-34; 8; 16
Ballast	—Liquid	1040 lb each	None
	Cast iron	1120 lb each	None
Front tires	—No, size, ply & psi	Two 7.50-15; 6; 32	Two 7.50-15; 6; 32
Ballast	—Liquid	None	None
	Cast iron	None	None
Height of drawbar		19 inches	20½ inches
Static weight	—Rear	10430 lb	6110 lb
	Front	2520 lb	2550 lb
Total weight with operator		13125 lb	8835 lb

Department of Agricultural Engineering

Dates of Test: October 5 to October 11, 1963

Manufacturer: JOHN DEERE WATERLOO TRACTOR WORKS, WATERLOO, IOWA

Manufacturer's Power Rating: Not rated

FUEL, OIL and TIME Fuel commercial propane **Specific gravity converted to 60°/60°** 0.5103 **Weight per gallon** 4.25 lb **Oil** SAE 20-20W **API service classification** MS, DM **To motor** 2.026 gal **Drained from motor** 1.144 gal **Transmission and final-drive lubricant** John Deere special 303 oil **Total time engine was operated** 40½ hours.

ENGINE Make John Deere LPG **Type** 6 cylinder vertical **Serial No** 22E65016 **Crankshaft mounted** lengthwise **Rated rpm** 2200 **Bore and stroke** 4¼" x 4" **Compression ratio** 9.0 to 1 **Displacement** 340 cu in **Carburetor size** $1^{11}/_{16}$" **Ignition system** battery **Cranking system** 12 volt electric **Lubrication** pressure **Air cleaner** oil washed wire screen **Oil filter** full flow replaceable paper element **Oil cooler** radiator for transmission and hydraulic oil **Fuel filter** felt pack and screen in fuel lock strainer **Muffler** was used **Cooling medium temperature control** two thermostats.

CHASSIS Type tricycle **Serial No** 21T65572 **Tread width** rear 60" to 91" front 8⅜" to 18¼" **Wheel base** 97½" **Center of gravity** (without operator or ballast, with minimum tread, with fuel tank filled and tractor serviced for operation) Horizontal distance forward from centerline of rear wheels 28.3" Vertical distance above roadway 36.4" Horizontal distance from center of rear wheel tread 0" to the right/left **Hydraulic control system** direct engine drive **Transmission** fixed ratio operator controlled full range power shifting **Advertised speeds mph** (at 1900 rpm) first 1½ second 2⅛ third 3¼ fourth 4¼ fifth 5½ sixth 7 seventh 9¼ eighth 15½ reverse 1¾, 2½, 3¾, and 5 **Clutch** two multiple disc wet clutches within transmission hydraulically operated **Brakes** wet disc hydraulically power actuated operated by two foot pedals which can be locked together **Steering** hydraulic with power assist **Turning radius** (on concrete surface with brake applied) right 120" left 120" (on concrete surface without brake) right 146" left 146" **Turning space diameter** (on concrete surface with brake applied) right 283¼" left 283¼" (on concrete surface without brake) right 335" left 335" **Belt pulley** 966 rpm at 1900 engine rpm diam 12" face 8½" Belt speed 3035 fpm Power take-off 1003 rpm at 1900 engine rpm.

REPAIRS and ADJUSTMENTS No repairs or adjustments.

REMARKS All test results were determined from observed data obtained in accordance with the SAE and ASAE test code.

First gear was not run as it was necessary to limit the pull in second gear to avoid excessive wheel slippage. Eighth gear was not run as it exceeded 15 mph.

We, the undersigned, certify that this is a true and correct report of official Tractor Test 853.

L. F. LARSEN
Engineer-in-Charge

L. W. HURLBUT, Chairman
G. W. STEINBRUEGGE
J. J. SULEK
Board of Tractor Test Engineers

EXPLANATION OF TEST REPORT

GENERAL CONDITIONS

Each tractor is a production model equipped for common usage. Power consuming accessories can be disconnected only when it is convenient for the operator to do so in practice. Additional weight can be added as ballast if the manufacturer regularly supplies it for sale. The static tire loads and the inflation pressures must conform to recommendations in the Tire Standards published by the Society of Automotive Engineers.

PREPARATION FOR PERFORMANCE RUNS

The engine crankcase is drained and refilled with a measured amount of new oil conforming to specifications in the operators manual. The fuel used and the maintenance operations must also conform to the published information delivered with the tractor. The tractor is then limbered-up for 12 hours on drawbar work in accordance with the manufacturer's published recommendations. The manufacturer's representative is present to make appropriate decisions regarding mechanical adjustments.

The tractor is equipped with approximately the amount of added ballast that is used during maximum drawbar tests. The tire tread-bar height must be at least 65% of new tread height prior to the maximum power run.

BELT OR POWER TAKE-OFF PERFORMANCE

Maximum Power and Fuel Consumption. The manufacturer's representative makes carburetor, fuel pump, ignition and governor control settings which remain unchanged throughout all subsequent runs. The governor and the manually operated governor control lever is set to provide the high-idle speed specified by the manufacturer for maximum power. Maximum power is measured by connecting the belt pulley or the power take-off to a dynamometer. The dynamometer load is then gradually increased until the engine is operating at the rated speed specified by the manufacturer for maximum power. The corresponding fuel consumption is measured.

Varying Power and Fuel Consumption. Six different horsepower levels are used to show corresponding fuel consumption rates and how the governor causes the engine to react to the following changes in dynamometer load: 85% of the dynamometer torque at maximum power; minimum dynamometer torque, ½ the 85% torque; maximum power, ¼ and ¾ of the 85% torque. Since a tractor is generally subjected to varying loads the average of the results in this test serve well for predicting the fuel consumption of a tractor in general usage.

DRAWBAR PERFORMANCE

All engine adjustments are the same as those used in the belt or power take-off tests. If the manufacturer specifies a different rated crankshaft speed for drawbar operations, then the position of the manually operated governor control is changed to provide the high-idle speed specified by the manufacturer in the operating instructions.

Varying Power and Fuel Consumption With Ballast. The varying power runs are made to show the effect of speed-control devices (engine governor, automatic transmission, etc.) on horsepower, speed and fuel consumption. These runs are made around the entire test course which has two 180 degree turns with a minimum radius of 50 feet. The drawbar pull is set at 3 different levels as follows: (1) as near to the pull at maximum power as possible and still have the tractor maintain the travel speed at maximum horsepower on the straight sections of the test course; (2) 75% of the pull at maximum power; and (3) 50% of the pull at maximum power. Prior to 1958, fuel consumption data (10 hour test) were shown only for the pull obtained at maximum power for tractors having torque converters and at 75% of the pull obtained at maximum power for gear-type tractors.

Maximum Power with Ballast. Maximum power is measured on straight level sections of the test course. Data are shown for not more than 12 different gears or travel speeds. Some gears or travel speeds may be omitted because of high slippage of the traction members or because the travel speed may exceed the safe-limit for the test course. The maximum safe speed for the Nebraska Test Course has been set at 15 miles per hour. The slippage limits have been set at 15% and 7% for pneumatic tires and steel tracks or lugs, respectively. Higher slippage gives widely varying results.

Maximum Power Without Ballast. All added ballast is removed from the tractor. The maximum drawbar power of the tractor is determined by the same procedure used for getting maximum power with ballast. The gear (or travel speed) is the same as that used in the 10-hour test.

Varying Power and Travel Speed with Ballast. Travel speeds corresponding to drawbar pulls beyond the maximum power range are obtained to show the "lugging ability" of the tractor. The run starts with the pull at maximum power; then additional drawbar pull is applied to cause decreasing speeds. The run is ended by one of three conditions: (1) maximum pull is obtained, (2) the maximum slippage limit is reached, or (3) some other operating limit is reached.

For additional information about the **Nebraska Tractor Tests** write to the **Department of Agricultural Engineering, University of Nebraska, Lincoln, Nebraska.**

John Deere 4020 LPG